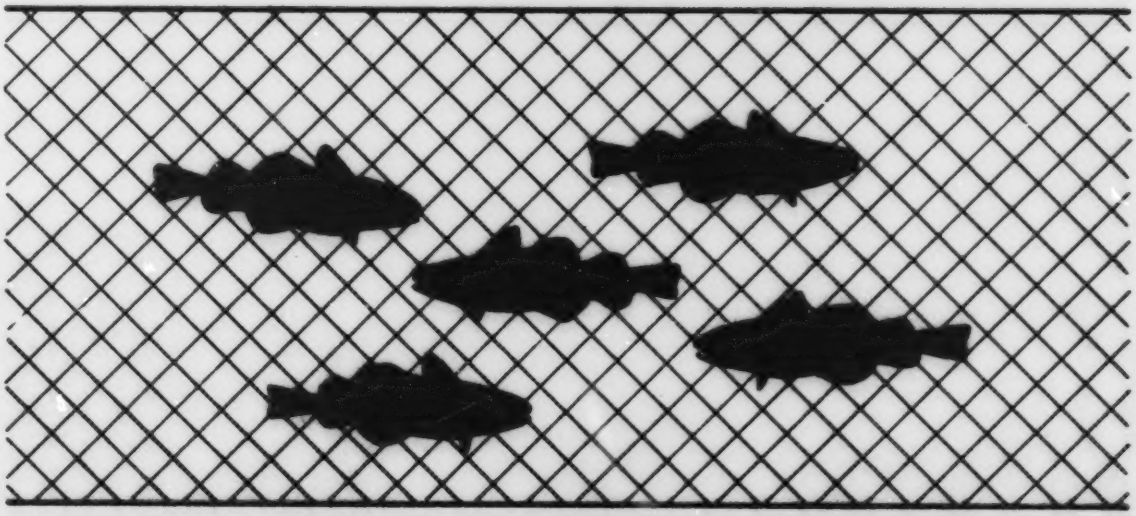
GOVERNMENT OF CANADA

FISHERIES AND OCEANS

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR

DEPARTMENT OF FISHERIES

A STUDY INTO THE EFFECT OF INCREASING THE MINIMUM MESH SIZE IN COD TRAPS FROM 89mm (3½") TO 102mm (4")



A JOINT PROJECT

DEVELOPMENT BRANCH
(NEWFOUNDLAND REGION)
DEVELOPMENT & ANALYSIS DIVISION
DEPARTMENT OF FISHERIES AND OCEANS

DEVELOPMENT BRANCH
FISHING OPERATIONS DIVISION
NEWFOUNDLAND DEPARTMENT OF FISHERIES

85-3532/

CORRIGENDUM

Abstract - Line 1 ... in 1982 should read "in 1983"

Page 26 - Line 21 ... the 192mm trap should read "the 102mm trap"

A STUDY INTO THE EFFECT OF INCREASING THE MINIMUM MESH SIZE IN COD TRAPS FROM 89MM (3½") TO 102MM (4")

BY

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MAY 31 1984

ABSTRACT

In four selected areas of Newfoundland in 1982, cod traps containing a stretched mesh size of 102mm (4") were fished near traps containing the commonly used 89mm (3½") and 92mm (3 5/8") mesh. Comparative data was collected on the degree of meshing and the size composition of the catch throughout the trapping season.

In three of the four areas, the average length of cod meshed in the 89mm and 92mm traps was under 40cm. (the minimum size usually purchased by processors) whereas the average length of cod in the 102mm mesh traps in all areas was over 40cm. The average length of fish trapped in the 102mm traps was in all instances greater than the average length of fish in the 89mm and 92mm traps. The degree of meshing is related to the size of catch, however, prolonged holding in a confined area caused severe meshing problems. No significant difference was found in the girth-length relationship or the girth size between study areas.

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INTRODUCTION

The cod trap for the past 100 years has proven to be an effective method for catching cod, particulary during the period of May - August. It is during this period when cod and other species follow the caplin onshore. From 1969-77 cod traps accounted for approximately 42 percent of the total inshore landings. This has levelled off in recent years to approximately 30 percent.

The Newfoundland cod trap (Figure 1a) has undergone some modifications to the entrance or front of the trap since it was first used, however, it still remains box shaped and usually measuring 90-130 metres on the round and 10-30 metres deep. One characteristic of the trap has been the custom of using a mesh size anywhere from 150-200mm along the sides and front walls and a smaller mesh size (usually 76-89mm) in the back section where fish are "dried up".* Fishermen felt that the large mesh in the walls and front section allowed adequate provision for small fish to escape and the small mesh in the drying twine reduced excessive meshing.

Introduction of the Japanese cod trap (Figure 1b) in 1966 had a distinct effect on fishing patterns. The whole inner chamber usually contained mesh of 76-89mm and when combined with a roof of similar mesh size, this resulted in increased catches of small fish.

*Fish confined to one end of net near surface in readiness for transfer into the boat.

Table 1: Conversion tables.

Inches and fractions to millimetres (1" = 25.4 mm)
Pouces et fractions en millimètres

Inches *Pouces*	0	1	2	3	4	5	6	7	8	9	10	11
	millimetres — *millimètres* (mm)											
0	—	25.40	50.80	76.20	101.60	127.00	152.40	177.80	203.20	228.60	254.00	279.40
1/16	1.59	26.99	52.39	77.79	103.19	128.59	153.99	179.39	204.79	230.19	255.59	280.99
1/8	3.18	28.58	53.98	79.38	104.78	130.18	155.58	180.98	206.38	231.78	257.18	282.58
3/16	4.76	30.16	55.56	80.96	106.36	131.76	157.16	182.56	207.96	233.36	258.76	284.16
1/4	6.35	31.75	57.15	82.55	107.95	133.35	158.75	184.15	209.55	234.95	260.35	285.75
5/16	7.94	33.34	58.74	84.14	109.54	134.94	160.34	185.74	211.14	236.54	261.94	287.34
3/8	9.53	34.93	60.33	85.73	111.13	136.53	161.93	187.33	212.73	238.13	263.53	288.93
7/16	11.11	36.51	61.91	87.31	112.71	138.11	163.51	188.91	214.31	239.71	265.11	290.51
1/2	12.70	38.10	63.50	88.90	114.30	139.70	165.10	190.50	215.90	241.30	266.70	292.10
9/16	14.29	39.69	65.09	90.49	115.89	141.29	166.69	192.09	217.49	242.89	268.29	293.69
5/8	15.88	41.28	66.68	92.08	117.48	142.88	168.28	193.68	219.08	244.48	269.88	295.28
11/16	17.46	42.86	68.26	93.66	119.06	144.46	169.86	195.26	220.66	246.06	271.46	296.86
3/4	19.05	44.45	69.85	95.25	120.65	146.05	171.45	196.85	222.25	247.65	273.05	298.45
13/16	20.64	46.04	71.44	96.84	122.24	147.64	173.04	198.44	223.84	249.24	274.64	300.04
7/8	22.23	47.63	73.03	98.43	123.83	149.23	174.63	200.03	225.43	250.83	276.23	301.63
15/16	23.81	49.21	74.61	100.01	125.41	150.81	176.21	201.61	227.01	252.41	277.81	303.21

Feet to metres (1' = 0.304 8 m)
Pieds en mètres

Feet *Pieds*	0	1	2	3	4	5	6	7	8	9
	metres — *mètres* (m)									
0	—	0.305	0.610	0.914	1.219	1.524	1.829	2.134	2.438	2.743
10	3.048	3.353	3.658	3.962	4.267	4.572	4.877	5.182	5.486	5.791
20	6.096	6.401	6.706	7.010	7.315	7.620	7.925	8.230	8.534	8.839
30	9.144	9.449	9.754	10.058	10.363	10.668	10.973	11.278	11.582	11.887
40	12.192	12.497	12.802	13.106	13.411	13.716	14.021	14.326	14.630	14.935
50	15.240	15.545	15.850	16.154	16.459	16.764	17.069	17.374	17.678	17.983
60	18.288	18.593	18.898	19.202	19.507	19.812	20.117	20.422	20.726	21.031
70	21.336	21.641	21.946	22.250	22.555	22.860	23.165	23.470	23.774	24.079
80	24.384	24.689	24.994	25.298	25.603	25.908	26.213	26.518	26.822	27.127
90	27.432	27.737	28.042	28.346	28.651	28.956	29.261	29.566	29.870	30.175
100	30.480	30.785	31.090	31.394	31.699	32.004	32.309	32.614	32.918	33.223
110	33.528	33.833	34.138	34.442	34.747	35.052	35.357	35.662	35.966	36.271
120	36.576	36.881	37.186	37.490	37.795	38.100	38.405	38.710	39.014	39.319
130	39.624	39.929	40.234	40.538	40.843	41.148	41.453	41.758	42.062	42.367
140	42.672	42.977	43.282	43.586	43.891	44.196	44.501	44.806	45.110	45.415
150	45.720	46.025	46.330	46.634	46.939	47.244	47.549	47.854	48.153	48.463
160	48.768	49.073	49.378	49.682	49.987	50.292	50.597	50.902	51.206	51.511
170	51.816	52.121	52.426	52.730	53.035	53.340	53.645	53.950	54.254	54.559
180	54.864	55.169	55.474	55.778	56.083	56.388	56.693	56.998	57.302	57.607
190	57.912	58.217	58.522	58.826	59.131	59.436	59.741	60.046	60.350	60.655
200	60.960									

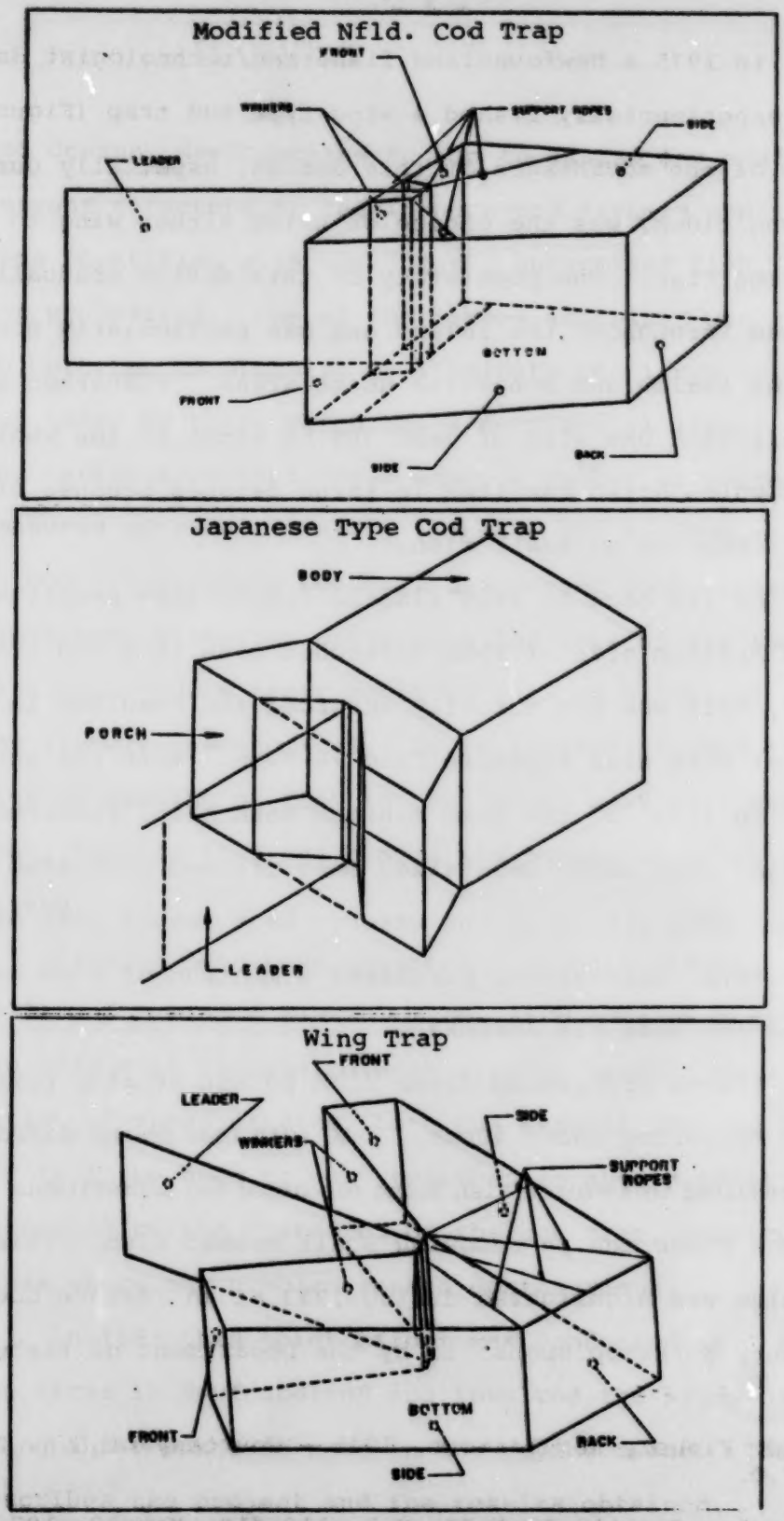


Figure 1: Sketch of 3 types of cod trap used in the project.

In 1975 a Newfoundland fisherman/technologist designed and experimentally fished a wing-type cod trap (Figure 1c). Some of the advantages of this design, especially during strong tides, was the choice of using either wing to "dry up" the fish. The popularity of this design gradually spread throughout the Island and was particularly popular in the Avalon and Bonavista North areas. Fishermen generally used one size of mesh (89 or 92mm) in the whole trap which often resulted in large catches because of the retention of small fish.

As far back as 1919[1] fishing regulations permitted use of a minimum size of 89mm stretched mesh in a cod trap, however, this was not strictly enforced and resulted in common use of mesh size anywhere from 76-89mm. With the enforcement in 1978[2] of the 89mm minimum mesh size, fishermen charged with using undersized mesh claimed that 89mm mesh shrunk when placed in the water. As a result gear manufacturers, thereafter, purchased a minimum of 92mm mesh to allow for possible shrinkage.

Plants processing fresh fish do not usually purchase fish measuring under 40cms., i.e. with head on and gutted. This has resulted in immature fish being discarded and unprofitable labour to the fishermen in removing small meshed fish. This problem was highlighted during 1983 at an Inshore Cod Fishery Workshop sponsored by the Department of Fisheries

[1]Nfld. Fishery Regulations, 1919 - Courtesy of G.H. Rendell, D.F.O.

[2]Canadian Gazette Part II, Vol. 112 #10, May 12, 1978.

and Oceans, Newfoundland Region to assess and evaluate the current structure of the inshore cod fishery and the problems identified with the "glut", undersized fish, quality and processing. One of the issues addressed was the measures to be taken to minimize or eliminate the large volume of small cod taken by traps which has a detrimental affect on quality and market acceptability. Among a number of corrective measures considered was to increase the minimum mesh size in cod traps. This proposal has caused much controversy since many fishermen claim that the loss of the smaller fish will reduce their catch to such an extent as to make the fishery uneconomical. It is further claimed that increased meshing of fish in the larger mesh will mean additional hauling time and reduce the number of traps they can attend.

Studies have been undertaken by both Federal (Bishop, 1982) and Provincial (Mercer & Allan, 1979) agencies to determine the effect of increasing mesh size in traps. As a continuation of these studies, both the Federal DFO and Provincial DOF felt the need to work together to obtain additional information on the operation of the cod trap, particularly in areas where the problem seemed most serious.

In 1983 this joint effort was conducted in 4 trap fishing areas in Newfoundland and involved the study of traps using three sizes of mesh in the drying twine. This report describes the project and the results obtained.

OPERATIONAL PLAN

Four locations, known for their cod trap activity, were selected as sites for this study. In each area one experimental trap containing 102mm mesh in the drying twine and not less than 102mm in the remaining sections was fished near a control trap(s) containing 89 (or 92) mm in the drying twine. Comparative data was obtained throughout the whole trapping season by a Project Observer who accompanied the crews while the traps were being hauled.

Data Collected

1. Fishing effort and catch.
2. Number of fish meshed in the drying twine per haul.
3. Length and girth measurement of both meshed and trapped fish.
4. Hauling time.

Data Collection Methods

An observer, at each location, made length measurements of a representative sample* of meshed and trapped fish. A standard metric measuring board was used for length measurements. Opercular girth measurements, using a flexible tape, were taken of one fish for each one centimeter length interval.

*Sample size - 70 kgs. (150 lbs.) of both meshed and trapped fish during each haul.

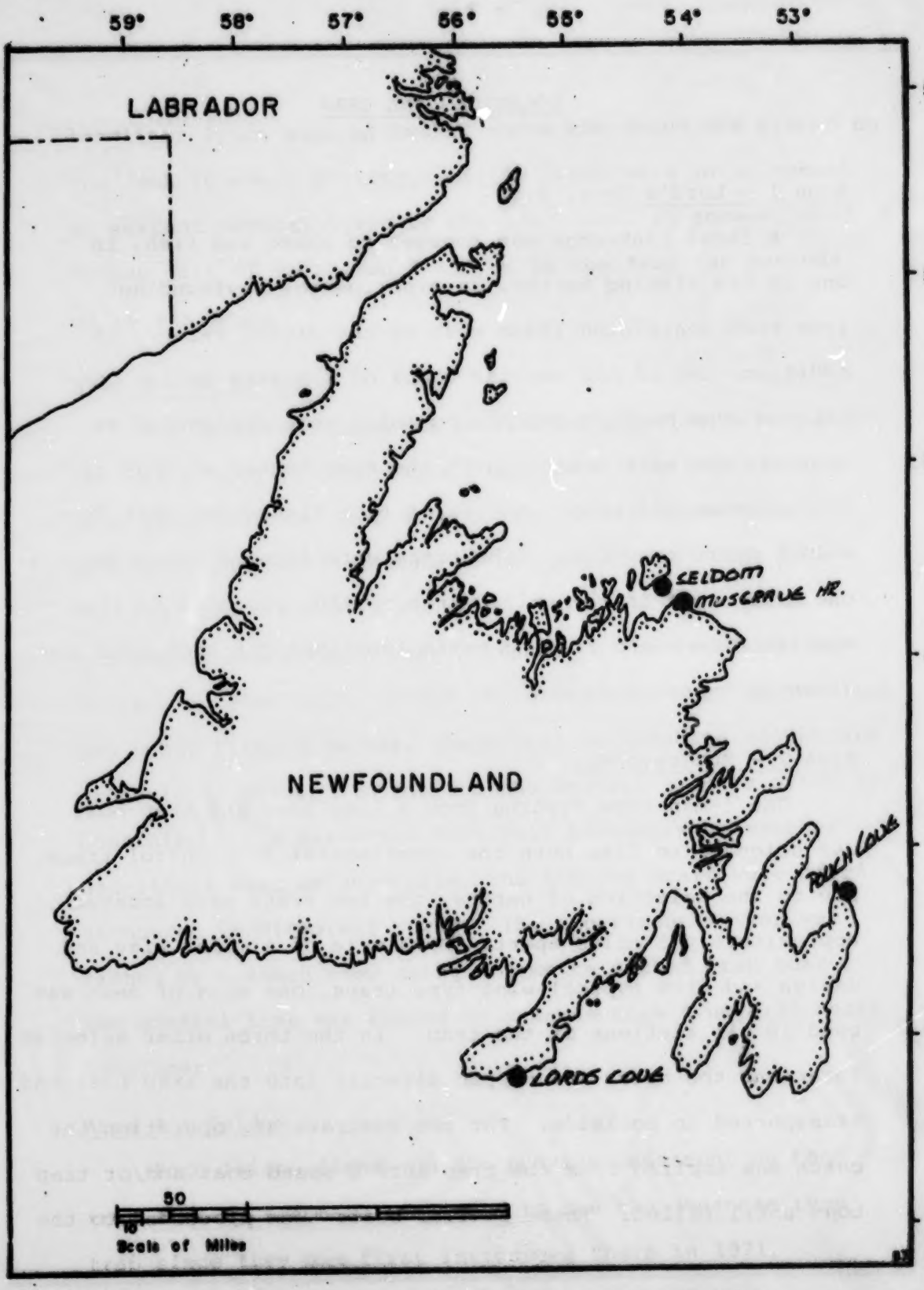


Figure 2: Showing location of the 4 study areas selected.

LOCATIONS AND GEAR

Area 1 - Lord's Cove, P.B.

A local fisherman was engaged to place and fish, in one of his fishing berths, an experimental Newfoundland type trap containing 102mm mesh in the drying twine. In addition, two of his regular traps of the same design containing 89mm mesh in the drying twine were designated as controls and were monitored in the same manner as that of the experimental trap. A crew of five fished the gear from a 10.6 metre trap boat. The traps were located approximately one mile apart in recognized trap berths. Details of trap specifications and fishing berth locations for each area are given in Appendix A.

Area 2 - Musgrave Hr.

One 5-man crew fishing from a longliner and trap boat was selected to fish both the experimental and control traps. Due to the selection of berths, the two traps were located approximately 5 miles apart. Both were of similar size and design and like typical wing type traps, one size of mesh was used in all sections of the trap. In the three other selected locations the catch was dipped directly into the trap boat and transported to dockside. For the Musgrave Hr. operation the catch was emptied from the trap into a speed boat and/or trap boat until filled. These smaller boats then proceeded to the

longliner lying anchored nearby where the catch was placed on the deck to await gutting. If the catch were large enough to warrant several trips to the longliner, it necessitated having part of the catch dried up in the trap for periods up to six hours.

Area 3 - Pouch Cove

The fisherman selected to fish an experimental trap did not own a trap of comparable size containing 89mm or 92mm mesh that could be used as a control. Arrangements were made with another fisherman to use one of his traps (containing 92mm mesh) as a control. This was considered acceptable since there were no traps in the immediate area containing 89mm mesh. Since there was only one observer and two boats fishing, he was, therefore, required to adjust his schedule to attempt to monitor the control trap as often as possible. This was often difficult because, when weather conditions were unfavourable, the fishing boats were often harboured in different coves. The experimental trap was fished by a 4-man crew using a 9 metre decked trap boat. The control trap was fished by a 4-man crew from a 15 metre longliner.

Area 4 - Seldom

Fogo Island fishermen are heavily dependent on the trap fishery and have continued to use the Japanese type trap since they were first introduced there in 1971.

One 5-man trap crew from the Seldom area was selected to fish both an experimental (102mm) and a similar type control trap (92mm). One other crew fishing nearby used two traps of varying sizes and all contained 89mm mesh in the drying twine. These traps were also monitored when time permitted.

RESULTS

Lord's Cove

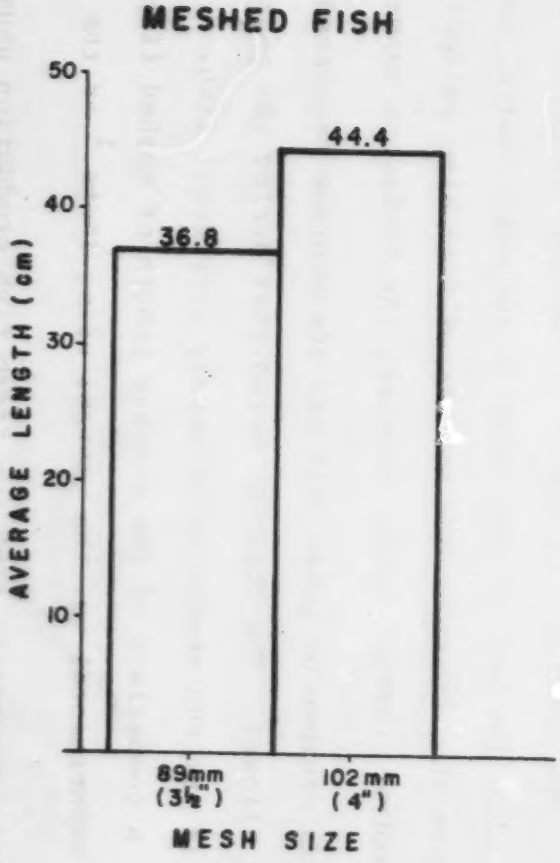
Although the traps were set between June 7 - 10 the first haul commenced on June 14 and ended on July 22.

Despite factors such as stormy weather, net damage and plant closure, the experimental trap was hauled 18 times and the control traps were hauled 17 and 22 times, respectively.

At the beginning of the fishing season, the only outlet for the catch was a local saltfish plant which accepted only fish 45cm. (18") and over. At that time any loss of small fish through the larger mesh webbing (102mm.) was of minor importance to the fishermen. The arrival of a foreign vessel purchasing both small and large fish caused a change in attitude, especially when, during hauling the experimental trap hundreds of fish could be seen escaping through the mesh. The observer, in his daily reports, estimated salvaging less than one half of the catch in the experimental trap due to escapement. Considerable numbers of fish also escaped through the control (89cm.) traps, however, the fishermen seemed resigned to this escapement since this was the minimum regulated size mesh allowed. The observer noted that during the period July 1 - 14 the run seemed to be mainly very small fish.

A comparison of the average length of meshed fish in the experimental vs. the control using 40cms.[1] as the minimum

[1]Plants processing fish for fresh fish production usually require cod fish to be not less than 40cm. (16") in length. This compares to 45cm. (18") for plants processing for saltfish.



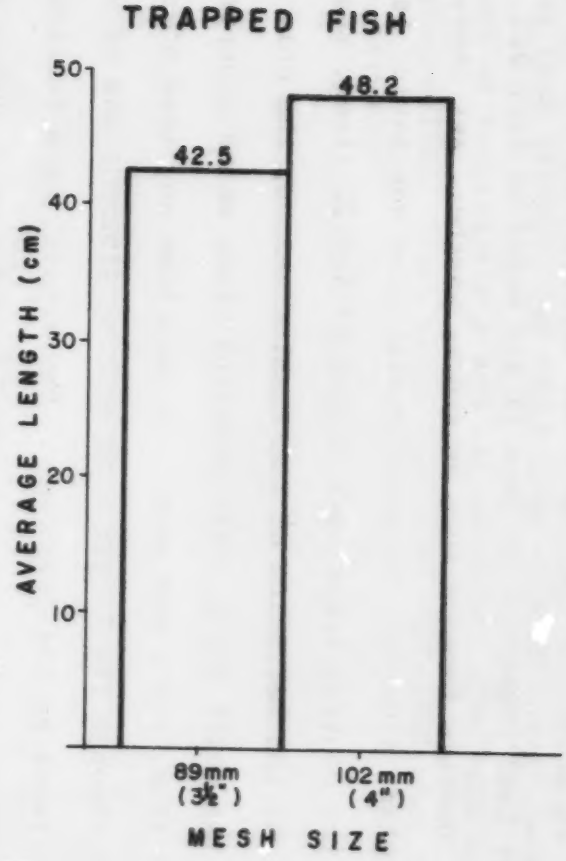


Figure 3: Average length of fish meshed and trapped - Lord's Cove.

Table 2: Comparison of the number of fish meshed per haul by catch size in Lord's Cove.

	Control Trap 89mm (3½")		Experimental Trap 102mm (4")	
Catch in Lbs. (kgs.)	# of Hauls	Avg. No. Fish Meshed (Range)	# of Hauls	Avg. No. Fish Mesned (Range)
0 - 2,000 (0 - 907)	20	156 (19-750)	14	89 (8-196)
2,000- 4,000 (907- 1,814)	11	232 (32-446)	2	338 (330-346)
4,000- 6,000 (1,814- 2,721)	6	309 (30-542)	-	-
6,000- 8,000 (2,721- 3,628)	1	551	2	584 (542-626)
8,000-10,000 (3,628- 4,535)	1	336	-	-

marketable size shows that the average size of meshed fish in the control trap was below the marketable size, whereas in the experimental trap the average size was 4.4cms. above the minimum, marketable size.

The size difference was consistent since sampling of the catch in both traps showed that the average size of fish in the experimental trap was 5.7cm. larger than those taken from the control traps.

Table 2 shows that although meshing seemed slightly more severe in 102mm mesh trap, it was not significant enought to cause concern.

Musgrave Harbour

The operational period extended from June 27 to July 19 and involved hauling the control trap 7 times compared to 11 hauls in the experimental trap. Catches were generally good and on several occasions exceeded 9,000 kgs. The procedure used to haul the trap was slow and, undoubtedly, resulted in more than normal amount of meshing. For example, on one day the catch of 1,360 kgs. required 2 hours to place onboard the boat. There were 511 fish meshed, the major portion having meshed after drying up was completed.

Table 3 shows that the average length of meshed cod in 92mm mesh trap was 1.7cms. below the acceptable marketing size (40cm.) compared with the 1.2cms. above for the 102mm mesh trap. The selectivity of the 102mm mesh trap was also shown by the average size of its trapped fish was 4.1cms. larger than that of the 92mm mesh control trap.

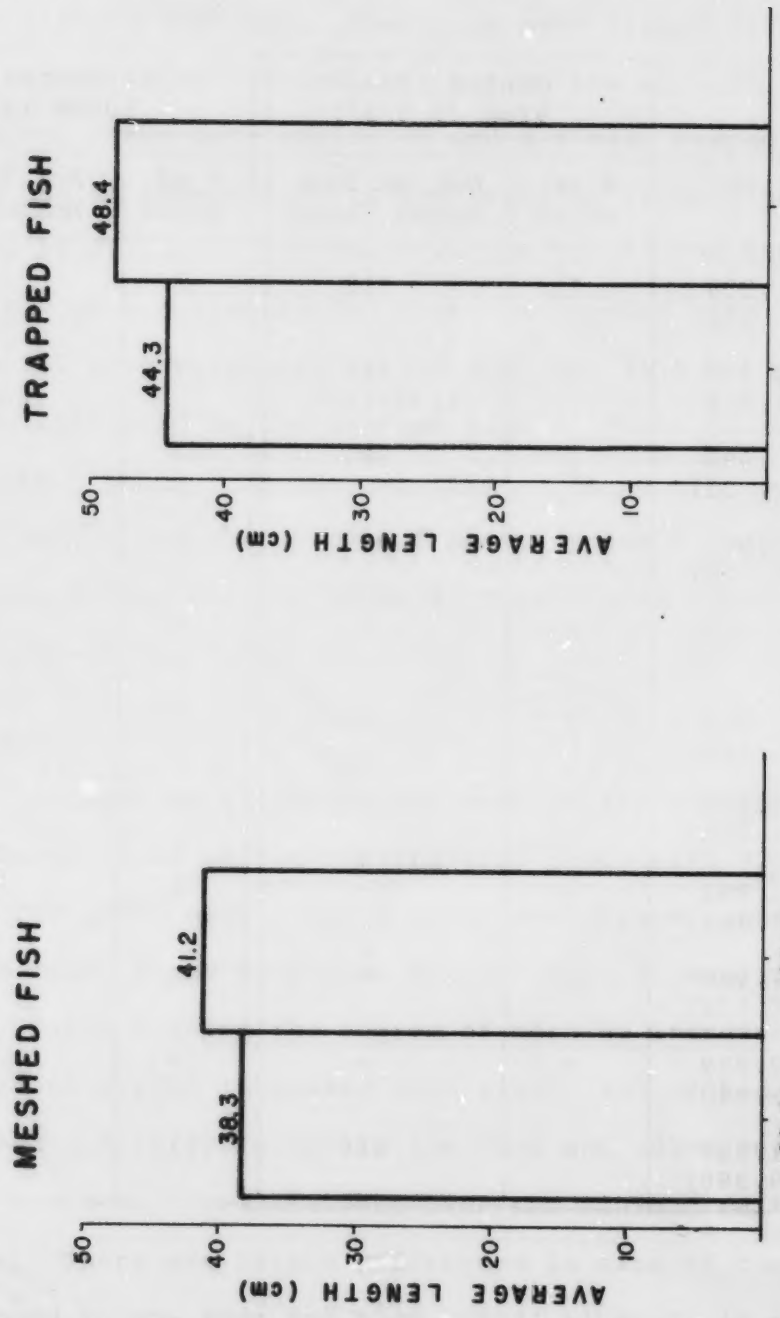


Figure 4: Average length of fish meshed and trapped - Musgrave Harbour.

Table 3: Comparison of the number of fish meshed per haul by catch size, Musgrave Hr.

	Control Trap 92mm (3 5/8")		Experimental Trap 102mm (4")	
Catch in Lbs. (kgs.)	# of Hauls	Avg. No. Fish Meshed (Range)	# of Hauls	Avg. No. Fish Meshed (Range)
0 - 1,999 (0 - 907)	1	319	1	216
2,000- 3,999 (907- 1,814	3	281 (135-414)	2	372 (233-511)
4,000- 5,999 (1,814- 2,721)	1	387	4	392 (238-532)
6,000- 7,999 (2,721- 3,628)	1	339	1	519
8,000- 9,999 (3,628- 4,535)	-	-	-	-
10,000-11,999 (4,535- 5,448)	-	-	1	588
12,000-13,999 (5,448- 6,356)	-	-	-	-
14,000-15,999 (6,356- 7,264)	-	-	1	1,357
16,000-17,999 (7,264- 8,172)	-	-	-	-
18,000-19,999 (8,172- 9,080)	-	-	-	-
20,000-21,999 (9,080- 9,988)	1	586	1	2,073

Pouch Cove

This is an exposed area of coastline and subject to strong winds and tides; these factors often interrupted the fishing schedule. The traps were fished from July 5 to August 10 and during that period the experimental and control traps were hauled 25 and 8 times, respectively. The use of separate boats and crews to attend the traps made it difficult for one observer to monitor them properly. Data collected did show that meshed fish in the control trap were smaller (38.9cm. vs. 45.0cm.) and was also reflected in the average size of fish (50.2cm. vs. 51.9cm.) taken from the two traps. At no time during the season did the degree of meshing pose a problem and as can be seen in Table 4, represented a small percentage of the total catch.

Seldom

A total of 17 hauls were made of the experiment trap compared to 10 in the control trap containing 92mm mesh. One fisherman nearby operated several traps containing 89mm mesh, these were each monitored on 9 hauls.

Table 5 shows the degree of meshing increased significantly with increased mesh size. The meshed fish seemed generally larger in the 92mm and 102mm mesh (1.6 cm. & 4.9cm., respectively over the minimum marketable size). There was little difference in size of the fish trapped in the 89mm and 92mm traps; however, in the 102mm trap the average size of fish was noticeably larger than for the smaller mesh traps.

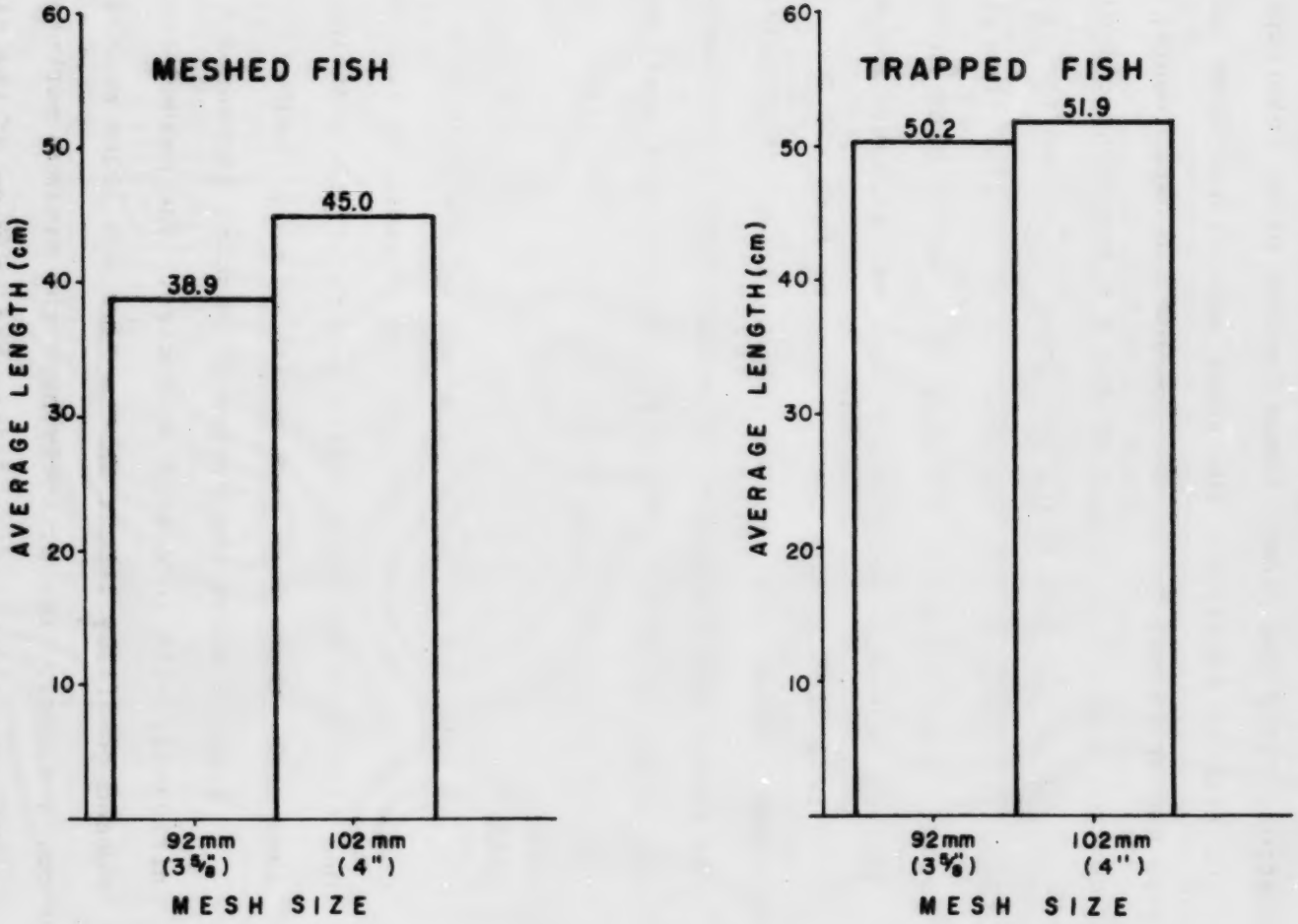
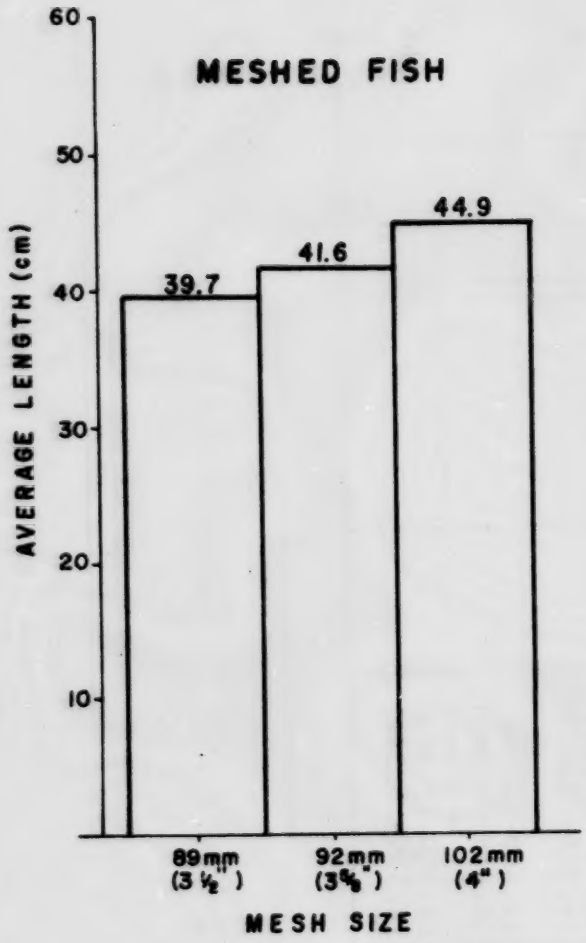


Figure 5: Average length of fish meshed and trapped - Pouch Cove.

Table 4: Comparison of the number of fish meshed per haul by catch size, Pouch Cove.

	Control Trap 92mm (3 5/8")		Experimental Trap 102mm (4")	
Catch in Lbs. (kgs.)	# of Hauls	Avg. No. Fish Meshed (Range)	# of Hauls	Avg. No. Fish Meshed (Range)
0 - 1,999 (0 - 907)	5	43 (12-85)	5	29 (7-51)
2,000- 3,999 (907- 1,814)	3	78 (52-97)	9	71 (24-272)
4,000- 5,999 (1,814- 2,721)	-	-	5	56 (39-74)
6,000- 7,999 (2,721- 3,628)	-	-	2	42 (26-57)
8,000- 9,999 (3,628- 4,535)	-	-	2	42 (37-57)
10,000-11,999 (4,535- 5,448)	-	-	1	150
12,000-13,999 (5,448- 6,356)	-	-	-	-
14,000-15,999 (6,356- 7,264)	-	-	1	205



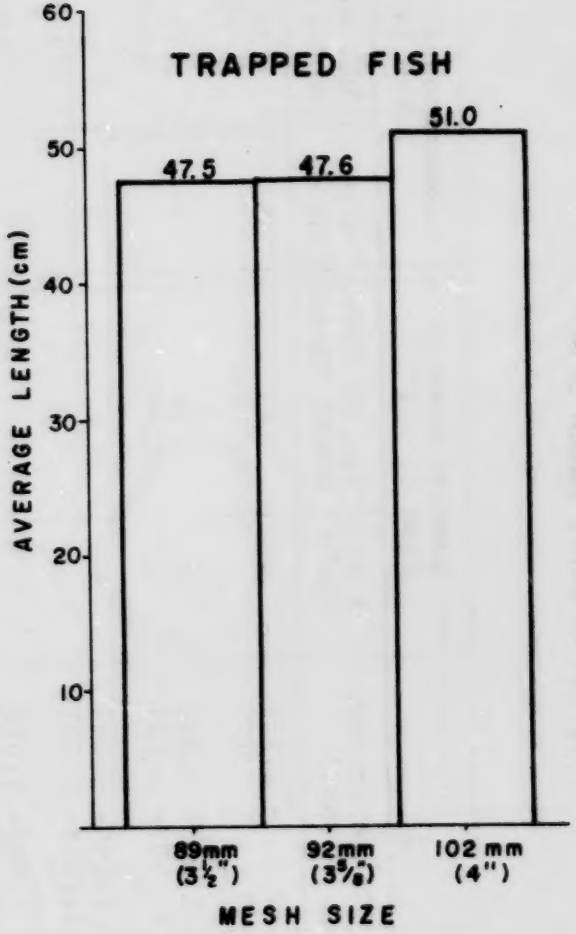


Figure 6: Average length of fish meshed and trapped - Seldom.

Table 5: Comparison of the number of fish meshed per haul by catch size, Seldom.

Catch in Lbs. (kgs.)	Control Trap 89mm (3½")		Control Trap 92mm (3 5/8")		Experimental Trap 102mm (4")	
	# of Hauls	Avg. No. Fish Meshed (Range)	# of Hauls	Avg. No. Fish Meshed (Range)	# of Hauls	Avg. No. Fish Meshed (Range)
0 - 1,999 (0 - 907)	5	45 (5-84)	6	41 (6-103)	4	115 (85-151)
2,000- 3,999 (907- 1,814)	-	-	2	52 (49-56)	5	137 (100-218)
4,000- 5,999 (1,814- 2,721)	1	57	-	-	5	167 (146-221)
6,000- 7,999 (2,721- 3,638)	1	55	1	144	1	114
8,000- 9,999 (3,638- 4,535)	2	65 (31-98)	1	242	2	244 (241-248)
10,000-11,999 (4,535- 5,448)	-	-	-	-	-	-

Undersized Fish taken in All Areas

Table 6 summarizes by area the percentage of fish either trapped or meshed that is considered undersized or non-marketable (i.e. $\leq$ 40cm.). It is noted that, for the 102mm trap in all areas, less than 10% of the catch was under 40cm.

Table 6: Percentage of catch under 40cm. (16") in the 4 study areas.

	Trapped (%)			Meshed (%)		
	89mm (3½")	92mm (3 5/8")	102mm (4")	89mm (3½")	92mm (3 5/8")	102mm (4")
Lord's Cove	35.0		3.5	92.3		12.6
Musgrave Hr.		29.5	8.3		76.4	47.2
Pouch Cove		0.8	0.9		76.7	10.6
Fogo Island	17.4	20.5	0.7	78.1	49.1	13.5

Girth-Length Relationship

A study of the data for the four survey areas showed that no significant difference exists between the girth-length relationship in the 4,164 samples taken.

Any variations can be attributed to sampling errors or natural differences in the morphometrics of the species.

Since the difference in girth between regions (Figure 7) is so small, the effect of girth size on meshing can be treated the same for all areas.

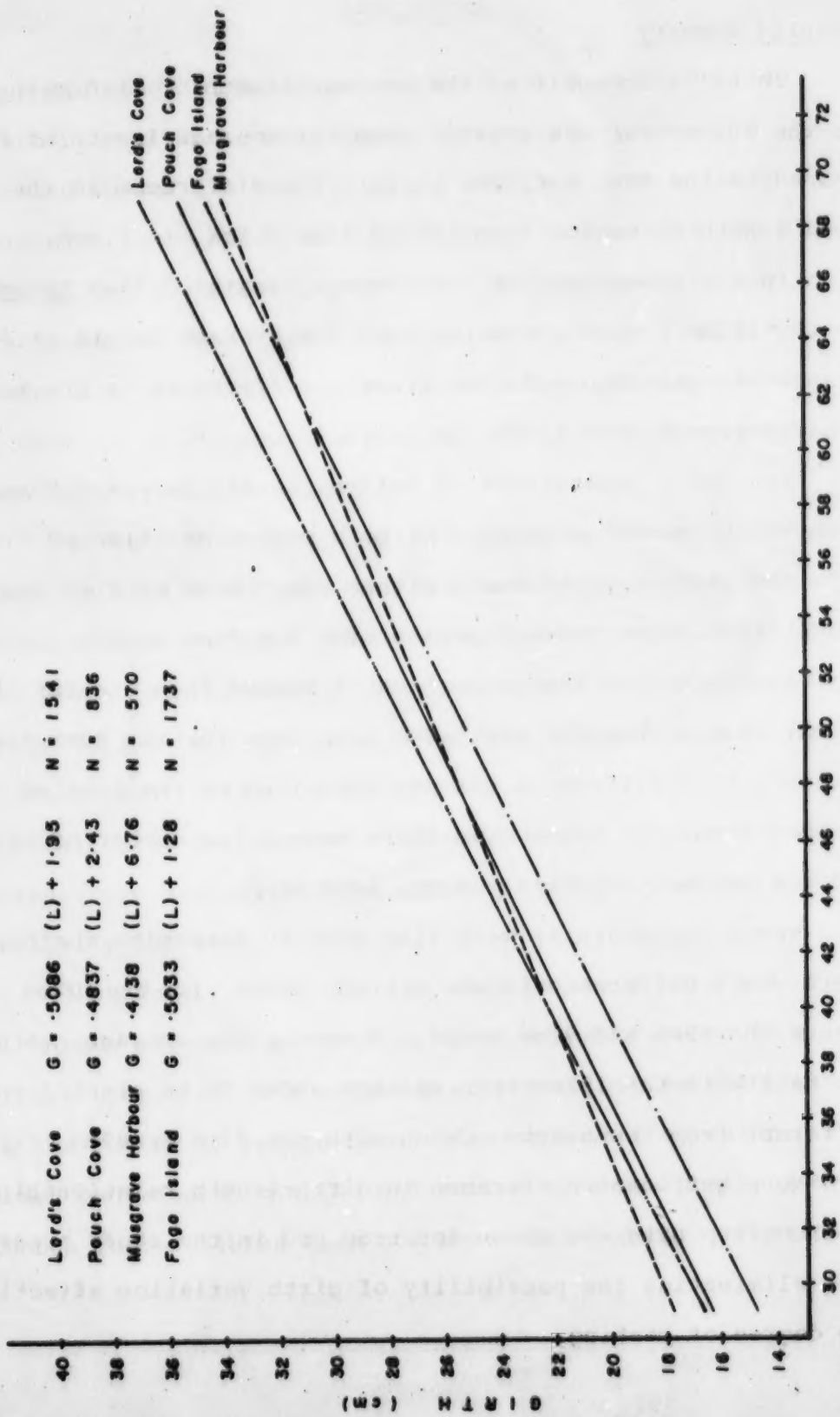


Figure 7: Relationship of average girth to length in samples taken from the 4 survey areas.

Results Summary

In all 4 communities the average length of fish meshed in the 102mm trap was greater than the average length of fish meshed in the 89mm and 92mm traps. The difference in the mean length of meshed fish ranged from 3.3cm. to 7.8cm.

In all 4 communities the average length of fish trapped in the 102mm trap was greater than the average length of fish trapped in the 89mm and 92mm traps. Differences in the mean lengths ranged from 1.7cm. to 9.9cm.

For the 3 communities of Seldom, Lord's Cove and Musgrave Harbour the measured samples of both meshed and trapped fish from the 102mm trap showed a higher proportion of fish over 40cms. than those taken from the 89mm and 92mm traps.

In Pouch Cove the proportion of meshed fish greater than 40cms. was higher for the 102mm trap than for the 92mm trap. However, this difference was not exhibited by the sampled trapped fish. In Pouch Cove there were a low number of hauls and low catches reported for the 92mm trap.

Tests (Appendix B) were also done to determine whether there was a difference in the average catch with the 102mm versus the 89mm and 92mm traps. However, the average catch per haul with the 192mm trap was not shown to be significantly different from the average catch with the 92mm or 89mm trap.

No significant difference in girth-length relationship or the girth size was shown for trap cod in the study areas, thus eliminating the possibility of girth variation affecting the degree of meshing.

DISCUSSION

The study highlighted the difficulty of conducting a study involving experimental and control traps in a setting where, for the fishermen involved, the primary objective is to catch as much fish as he can with the minimum effort in the shortest time. Factors such as buying practices and decisions to change berths when fish are scarce are not always controllable and compromises must be made as to whether the fishermen's income or proper data collection get priority.

It would have been desirable to have the same type traps in each area, however, this was not possible and added another variable. There was, however, a uniformity of cod traps fishing within the given area (i.e. Newfoundland traps fished in Pouch Cove, Wing type traps fished in Musgrave Harbour, etc.).

Although the general configuration of traps were different, the method used for drying up the fish at one end is basically the same.

Similarly, the twine size used in traps vary and often fishermen may have as many as three sizes of twine in a single trap. It is a common practice to put heavier twine in the bottom to reduce damage due to bottom abrasion. Fishermen continue to use the old cotton size designations eventhough cotton fibres have now been replaced by synthetics,

often the sizes given are, therefore, approximate. For example, traplon brand trap twine is officially numbered 210/42, whereas another competitive brand trapalon is numbered 250/32. The strength and size may vary and be assigned an equivalent cotton size number (i.e. 15, 18 or 21) based on visual observation only.

It is also recognized that all trap berths are subject to different weather conditions just as trap crews vary in proficiency from area to area.

Fortunately, data were obtained from four areas and the shortcomings or shortage of information in one location could be usually obtained from the other areas.

During the study there were no means whereby the degree of escapement could be determined. For Lord's Cove, the average size of meshed fish in the control trap was smaller than those taken from the other three areas. It was also the one area where the observer reported heavy escapement of fish (estimated up to 50%) while the trap was being hauled. This problem was reported in 1982 when it was estimated that 300,000 lbs. of undersized cod were dumped at Lord's Cove wharf (Rose, 1982). The use of a 102mm mesh trap in this area would likely result in reduced landings and make the trap fishery uneconomical. Fishermen cannot rely on sales to foreign vessels since there are no agreements in place to ensure future sales by this method.

The data from the four areas show that the degree of meshing is related to the size of the catch. This would follow since it has always been evident that the frenzy of activity occurs when fish are pursed together where they

touch one another. This results in increased activity directed at escaping through the netting. The high degree of meshing in the Musgrave Harbour traps is considered higher than normal due to the prolonged period of time fish were confined while awaiting transfer to another boat.

ACKNOWLEDGEMENTS

Persons involved in the planning and implementation of this project are acknowledged.

Project Advisors	- John Mercer	- D.F.O.
	- Harold Murphy	- D.O.F.
Project Co-ordinators	- Gerry Brothers	- D.F.O.
	- Ken Mercer - Ian Timmins	- D.O.F.
Scientific Authority	- Claude Bishop	- D.F.O.
	- Glenn Blackwood	- D.O.F.
Statistical Analysis	- Jim Warren - Patricia Hearn	- Newfoundland Statistics Agency
Gear Technician	- Nick Roche	- D.O.F.
Field Observers	- Jim Vaters	- D.F.O.
	- Dominic Lambe	- D.F.O.
	- Derrick Abbott	- D.F.O.
	- Ralph Rowe	- D.O.F.
Trap Crews	- Harris Vaters, Irvin Vaters	- Pouch Cove
	- Fred Fitzpatrick	- Lord's Cove
	- Harvey Cuff	- Musgrave Harbour
	- Frank Harnett, Jack Rowe	- Fogo Island

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Bishop, C.A., 1982. Cod Trap Mesh Selection Studies, Department of Fisheries and Oceans. Canadian Technical Report of Fisheries and Aquatic Sciences #1075.

Mercer, K.M. & G. Allan, 1979. Effect of Mesh Sizes on Cod Trap Performance in Fogo Island and Renews Areas During 1978. Government of Newfoundland and Labrador, Department of Fisheries Development Branch Report #2.

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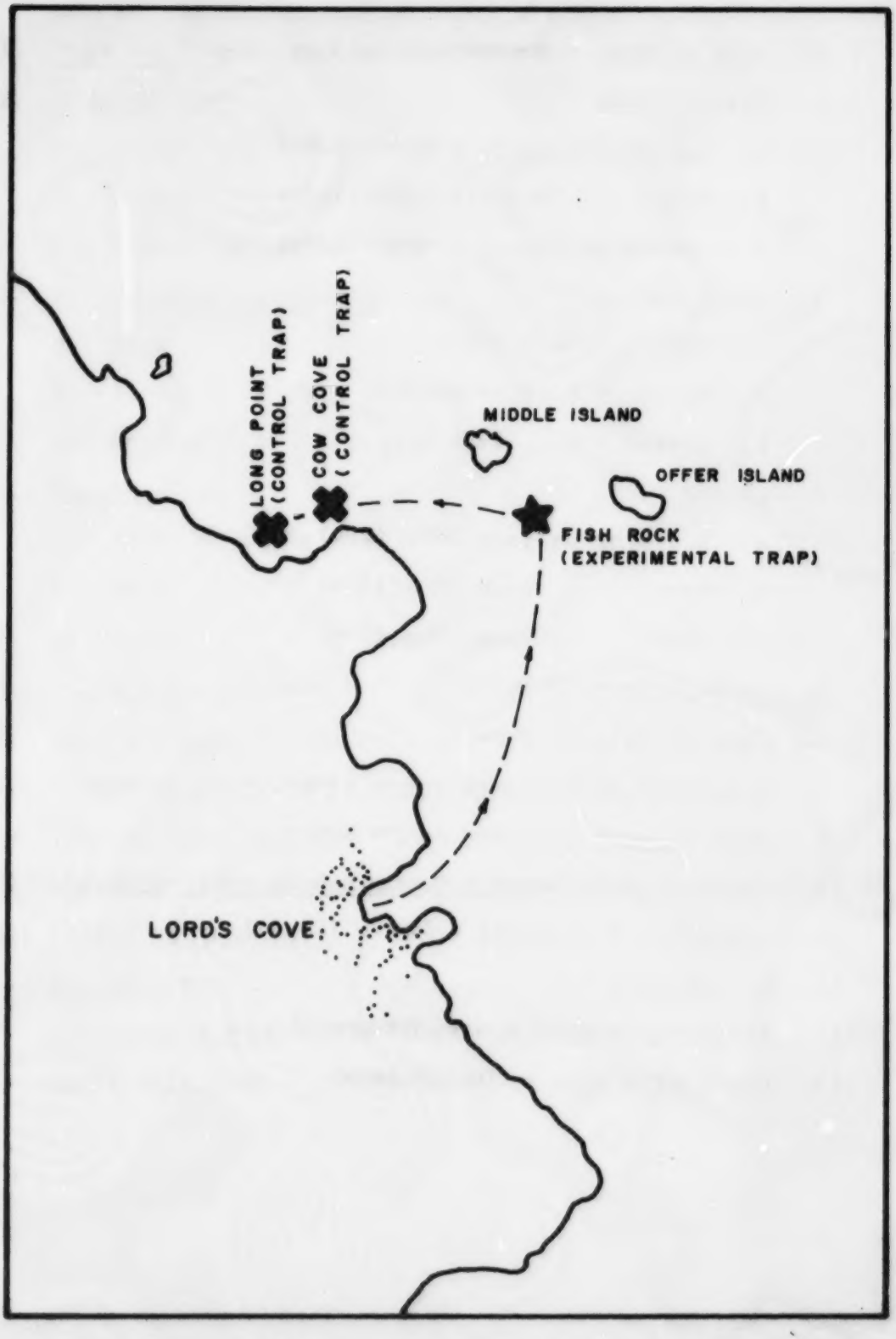
Rose, Cheslie, 1982. Report on the Inshore Fish Distribution Program for 1982. Government of Newfoundland and Labrador, Department of Fisheries, Field Services Division Report.

APPENDIX A

1. LOCATION OF TRAP BERTHS - LORD'S COVE
   - MUSGRAVE HR.
   - POUCH COVE
   - SELDOM

2. TRAP SPECIFICATIONS

LORD'S COVE


LONG POINT
(CONTROL TRAP)
COW COVE
(CONTROL TRAP)
MIDDLE ISLAND
OFFER ISLAND
FISH ROCK
(EXPERIMENTAL TRAP)
LORD'S COVE

COD TRAP MESH SELECTION STUDY

1. Type of Trap = Newfoundland Cod Trap
2. Size of Trap
   a. Depth = 10.5F (19m)
   b. Round = 56F (102m)
   c. Length of Leader = 150F (274m)
3. Mesh Size
   a. Back = 3½" (89m)
   b. Sides = 3 5/8" (92m)
   c. Bottom = 5" (127m)
4. Length
   a. Sides or walls = 16F (29m)
   b. Back = 15F (27m)
   c. Front = 19F (35m)
5. Twine Size = 18 Thread
6. Type of Twine = Trapalon
7. Treatment of Twine if any = None
8. Name of Area Trap Set = Cow Cove
9. Steaming Time between Control Trap and Experimental Trap = 10 Min.
10. Length of Trap Skiff = 35Ft. (10.6m)
11. No. of Crew = 5
12. Fishermen's Name = Fred Fitzpatrick
13. Observer's Name = Dominic Lambe

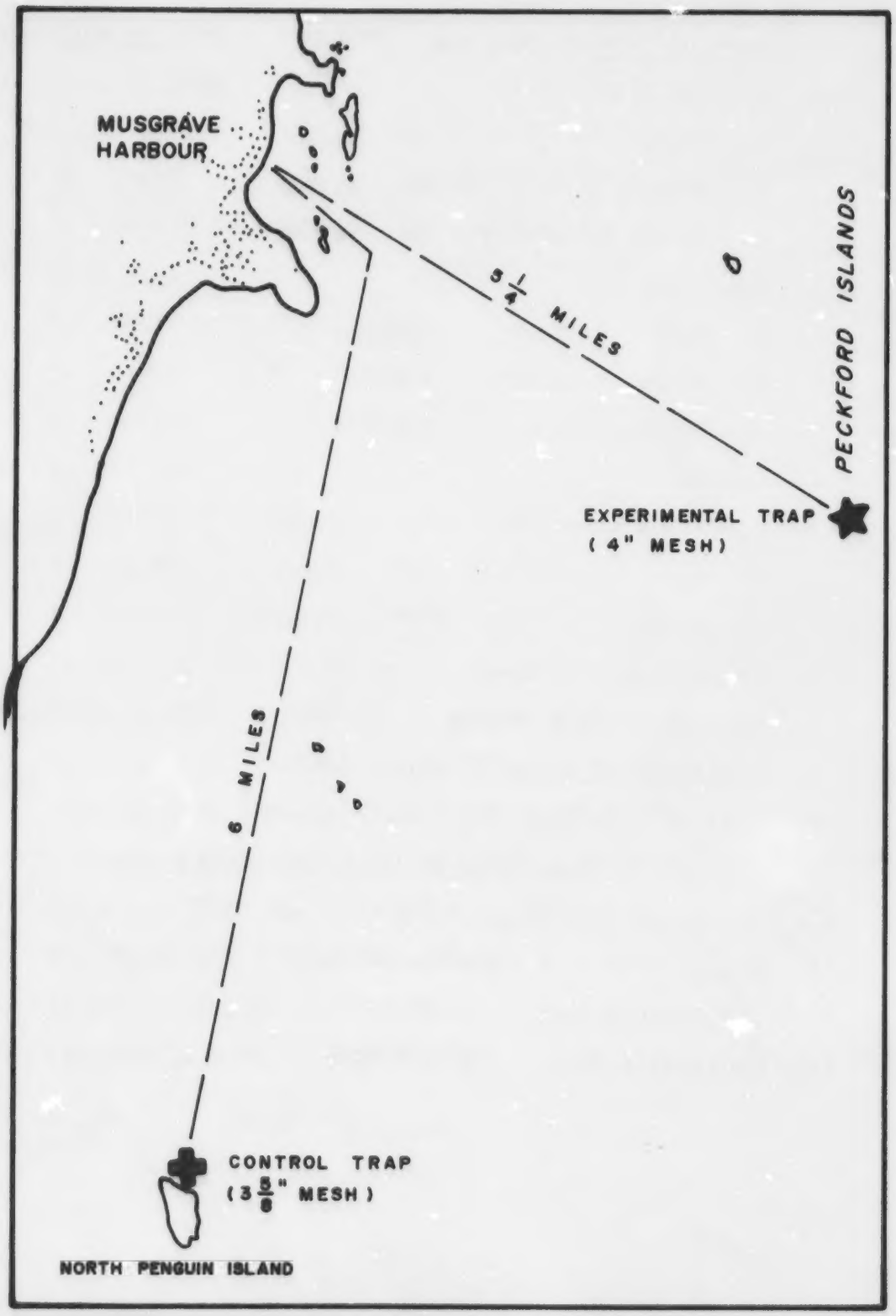
COD TRAP MESH SELECTION STUDY

1. Type of Trap = Newfoundland Cod Trap
2. Size of Trap
   a. Depth = 12F (22m)
   b. Round = 70F (128m)
   c. Length of Leader = 200F (366m)
3. Mesh Size
   a. Back = 3½" (89mm)
   b. Sides = 3 5/8" (92mm)
   c. Bottom = 4" (102mm)
4. Length
   a. Sides or walls = 16.5F (30m)
   b. Back = 16.0F (29m)
   c. Front = 22.0F (40m)
5. Twine Size = 18 Thread
6. Type of Twine = Trapalon
7. Treatment of Twine if any = None
8. Name of Area Trap Set = Long Point
9. Steaming Time between Control Trap and Experimental Trap = 13 Min.
10. Length of Trap Skiff = 35Ft. (10.6m)
11. No. of Crew = 5
12. Fishermen's Name = Fred Fitzpatrick
13. Observer's Name = Dominic Lambe

COD TRAP MESH SELECTION STUDY

1. Type of Trap = Newfoundland Cod Trap
2. Size of Trap
   a. Depth = 9F (16m)
   b. Round = 59F (108m)
   c. Length of Leader = 140F (256m)
3. Mesh Size
   a. Back = 4" (102mm)
   b. Sides = 4" (102mm)
   c. Bottom = 5" (127mm)
4. Length
   a. Sides or walls = 14F (26m)
   b. Back = 13F (24m)
   c. Front = 18F (33m)
5. Twine Size = 18 Thread
6. Type of Twine = Trapalon
7. Treatment of Twine if any = None
8. Name of Area Trap Set = Fish Rock
9. Steaming Time between Control Trap and Experimental Trap = 10 Min.
10. Length of Trap Skiff = 35Ft. (10.6m)
11. No. of Crew = 5
12. Fishermen's Name = Fred Fitzpatrick
13. Observer's Name = Dominic Lambe

MUSGRAVE HARBOUR


MUSGRAVE HARBOUR
5 1/4 MILES
PECKFORD ISLANDS
EXPERIMENTAL TRAP
(4" MESH)
6 MILES
CONTROL TRAP
(3 5/8" MESH)
NORTH PENGUIN ISLAND

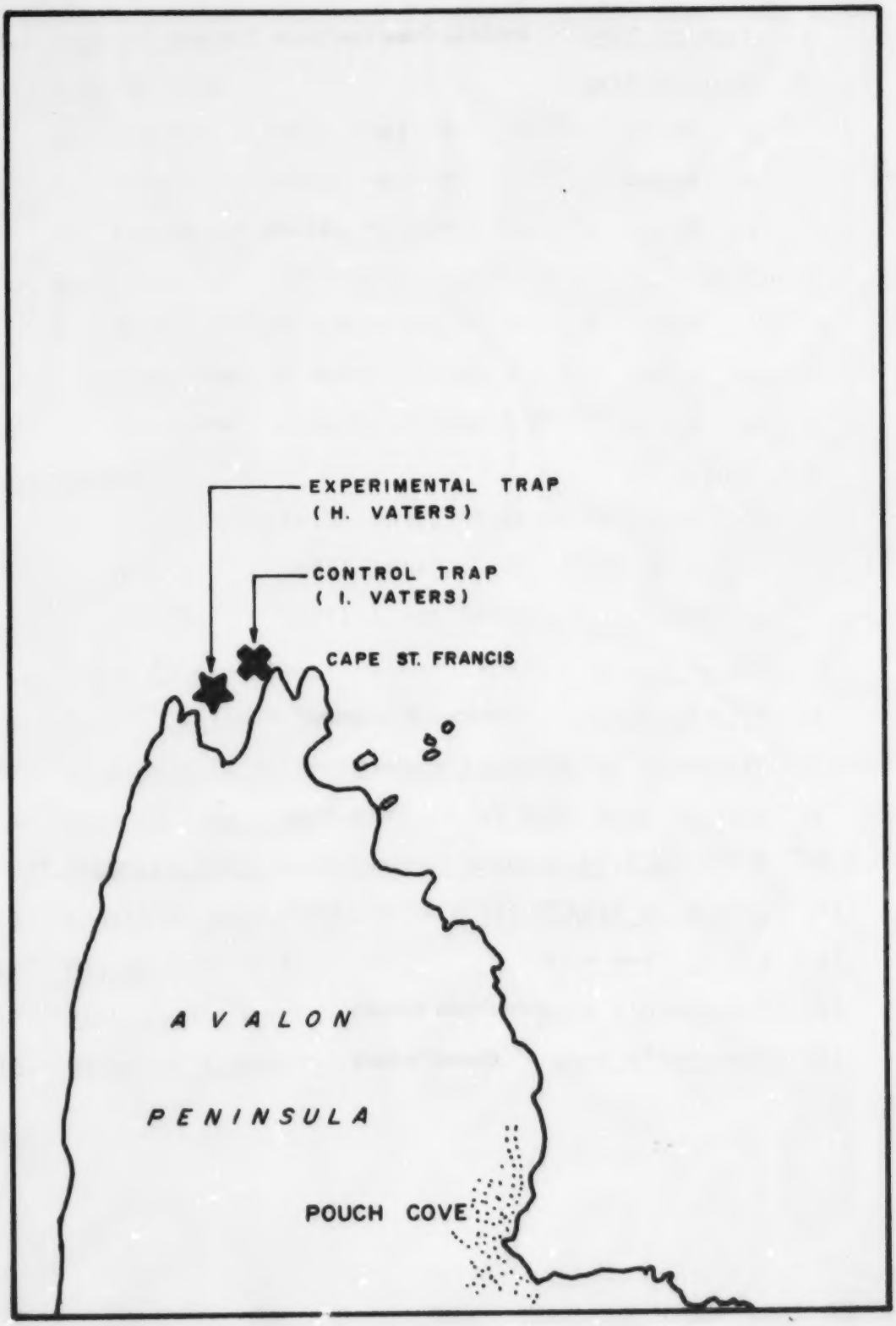
COD TRAP MESH SELECTION STUDY

1. Type of Trap = Wing Trap
2. Size of Trap
   a. Depth = 9F (16m)
   b. Round = 74F (135m)
   c. Length of Leader = 98F (179m)
3. Mesh Size
   a. Back = 3 5/8" (92mm)
   b. Sides = 3 5/8" (92mm)
   c. Bottom = 3 5/8" (92mm)
4. Length
   a. Sides or walls = 16.5F (30m)
   b. Back = 8.0F (15m)
   c. Front = 6.5F (12m)
5. Twine Size = 15 Thread
6. Type of Twine = Traplon
7. Treatment of Twine if any = None
8. Name of Area Trap Set = North Penguin
9. Steaming Time between Control Trap and Experimental Trap = 40 Min.
10. Length of Trap Skiff = 31Ft. (9m)
11. No. of Crew = 5 (including skipper)
12. Fishermen's Name = Harvey Cuff
13. Observer's Name = Derrick Abbot

COD TRAP MESH SELECTION STUDY

1. Type of Trap = Wing Trap
2. Size of Trap
   a. Depth = 9F (16m)
   b. Round = 74F (135m)
   c. Length of Leader = 150F (274m)
3. Mesh Size
   a. Back = 4" (102mm)
   b. Sides = 4" (102mm)
   c. Bottom = 4" (102mm)
4. Length
   a. Sides or walls = 16.5F (30m)
   b. Back = 8.0F (15m)
   c. Front = 8.5F (16m)
5. Twine Size = 15 Thread
6. Type of Twine = Traplon
7. Treatment of Twine if any = None
8. Name of Area Trap Set = Peckford Island Bight
9. Steaming Time between Control Trap and Experimental Trap = 40 Min.
10. Length of Trap Skiff = 31Ft. (9m)
11. No. of Crew = 5 (including skipper)
12. Fishermen's Name = Harvey Cuff
13. Observer's Name = Derrick Abbott

POUCH COVE


EXPERIMENTAL TRAP
(H. VATERS)
CONTROL TRAP
(I. VATERS)
CAPE ST. FRANCIS
AVALON
PENINSULA
POUCH COVE

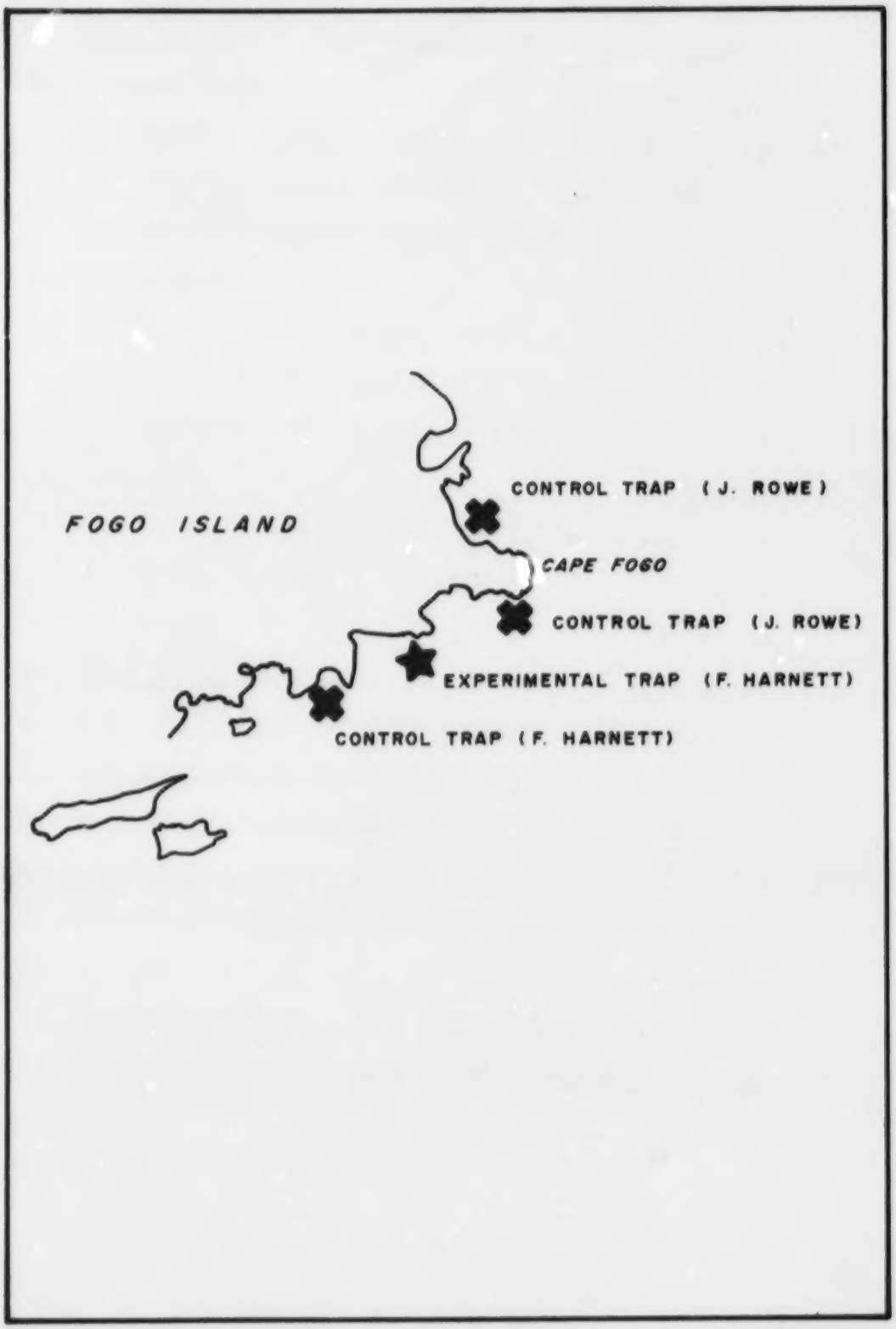
COD TRAP MESH SELECTION STUDY

1. Type of Trap = Modified Newfoundland Cod Trap
2. Size of Trap
   a. Depth = 12F (22m)
   b. Round = 68F (124m)
   c. Length of Leader = 40F (73m)
3. Mesh Size
   a. Back = 3 5/8" (92mm)
   b. Sides = 3 5/8" and 6" (92mm & 52mm)
   c. Bottom = 3 5/8" and 6" (92mm & 52mm)
4. Length
   a. Sides or walls = 17F (31m)
   b. Back = 14F (26m)
   c. Front = 20F (37m)
5. Twine Size = 210-18
6. Type of Twine = Knotless & Traplon
7. Treatment of Twine if any = None
8. Name of Area Trap Set = Pouch Cove
9. Steaming Time between Control Trap and Experimental Trap = 5 Min.
10. Length of Trap Skiff = 50Ft. (15m)
11. No. of Crew = 4
12. Fishermen's Name = Irvin Vaters
13. Observer's Name = James Vaters

COD TRAP MESH SELECTION STUDY

1. Type of Trap = Modified Newfoundland Cod Trap
2. Size of Trap
   a. Depth = 12.5F (23m)
   b. Round = 72.0F (132m)
   c. Length of Leader = 29.0F (153m)
3. Mesh Size
   a. Back = 4" (102mm)
   b. Sides = 5" (127mm)
   c. Bottom = 4" and 5' (102mm & 127mm)
4. Length
   a. Sides or walls = 18F (33m)
   b. Back = 14F (26m)
   c. Front = 22F (40m)
5. Twine Size = #18
6. Type of Twine = Nylon & Polyester
7. Treatment of Twine if any = Black Dyed
8. Name of Area Trap Set = Cracker Pole
9. Steaming Time between Control Trap and Experimental Trap = 5 Min.
10. Length of Trap Skiff = 28Ft. (8.5m)
11. No. of Crew = 4
12. Fishermen's Name = Harris G. Vaters
13. Observer's Name = James Vaters

SELDOM


FOGO ISLAND
CONTROL TRAP (J. ROWE)
CAPE FOGO
CONTROL TRAP (J. ROWE)
EXPERIMENTAL TRAP (F. HARNETT)
CONTROL TRAP (F. HARNETT)

COD TRAP MESH SELECTION STUDY

1. Type of Trap = Japanese
2. Size of Trap
   a. Depth = 8F (15m)
   b. Round = 57F (104m)
   c. Length of Leader = 168F (307m)
3. Mesh Size
   a. Back = 3 5/8" (92mm)
   b. Sides = 3 5/8" (92mm)
   c. Bottom = 3 5/8" (92mm)
4. Length
   a. Sides or walls = 10.5F (19m)
   b. Back = 10.0F (18m)
   c. Front =
5. Twine Size = Bottom 18, also same as the back.
6. Type of Twine = Vinyl
7. Treatment of Twine if any = Factory Treatment
8. Name of Area Trap Set = Crowing Inn
9. Steaming Time between Control Trap and Experimental Trap = 30 Min.
10. Length of Trap Skiff = 47Ft. (14m)
11. No. of Crew = 5
12. Fishermen's Name = Frank Harnett
13. Observer's Name = Ralph Rowe

COD TRAP MESH SELECTION STUDY

1. Type of Trap = Japanese
2. Size of Trap
   a. Depth = 10F (18m)
   b. Round = 74F (135m)
   c. Length of Leader = 290F (530m)
3. Mesh Size
   a. Back = 4" (102mm)
   b. Sides = 4" & 6" (102mm & 152mm)
   c. Bottom = 4" & 5" (102mm & 127mm)
4. Length
   a. Sides or walls = 12F (22m)
   b. Back = 14F (26m)
   c. Front =
5. Twine Size = 15
6. Type of Twine = Trapalon
7. Treatment of Twine if any = Factory Treatment
8. Name of Area Trap Set = Western Head
9. Steaming Time between Control Trap and Experimental Trap = 20 Min.
10. Length of Trap Skiff = 47Ft. (14m)
11. No. of Crew = 5
12. Fishermen's Name = Frank Harnett
13. Observer's Name = Ralph Rowe

COD TRAP MESH SELECTION STUDY

1. Type of Trap = Japanese
2. Size of Trap
   a. Depth = 8F (15m)
   b. Round = 57F (104m)
   c. Length of Leader = 100F (183m)
3. Mesh Size
   a. Back = 3½" (89mm)
   b. Sides = 3½" (89mm)
   c. Bottom = 3½" (89mm)
4. Length
   a. Sides or walls = 10.0F (18m)
   b. Back = 10.5F (19m)
   c. Front =
5. Twine Size = 15
6. Type of Twine = Vinyl
7. Treatment of Twine if any = Factory Treatment
8. Name of Area Trap Set = Golden Cup
9. Steaming Time between Control Trap and Experimental Trap = 20 Min.
10. Length of Trap Skiff = 38Ft. (11.5m)
11. No. of Crew = 5
12. Fishermen's Name = Jack Rowe
13. Observer's Name = Ralph Rowe

COD TRAP MESH SELECTION STUDY

1. Type of Trap = Japanese
2. Size of Trap
   a. Depth = 9F (16m)
   b. Round = 61F (112m)
   c. Length of Leader = 187F (342m)
3. Mesh Size
   a. Back = 3½" (89mm)
   b. Sides = 3½" (89mm)
   c. Bottom = 3½" (89mm)
4. Length
   a. Sides or walls = 11.0F (20m)
   b. Back = 11.5F (21m)
   c. Front =
5. Twine Size = 15
6. Type of Twine = Vinyl and Trapalon
7. Treatment of Twine if any = Factory Treatment
8. Name of Area Trap Set = Golden Cup
9. Steaming Time between Control Trap and Experimental Trap =
10. Length of Trap Skiff = 38Ft. (11.5m)
11. No. of Crew = 5
12. Fishermen's Name = Jack Rowe
13. Observer's Name = Ralph Rowe

APPENDIX B

STATISTICAL ANALYSIS OF DATA

BY NEWFOUNDLAND STATISTICS AGENCY

THE NUMBER OF HAULS, AVERAGE CATCH PER HAUL, AND STANDARD DEVIATION

	SELDOM, FOGO ISLAND			LORD'COVE		MUSGRAVE HARBOUR		POUCH COVE	
	3 1/2"	3 5/8"	4"	3 1/2"	4"	3 5/8"	4"	3 5/8"	4"
Number of Hauls	20	13	18	39	19	7	11	8	26
Average Catch per Haul (lbs.)	2,789	2,557	4,204	2,049	1,386	5,855	7,402	1,536	4,052
Standard Deviation	3,122	2,424	2,648	1,943	1,758	6,527	6,103	1,072	3,456

PER CENT OF FISH BY LENGTH CATEGORY FOR TRAPPED AND MESED FISH, BY MESH SIZE

SELDOM - FOGO ISLAND

Length (cm.)	Trapped			Meshed		
	Mesh Size (inches)					
	3 1/2 %	3 5/8 %	4 %	3 1/2 %	3 5/8 %	4 %
≤ 40	17.4	20.5	0.7	78.1	49.1	13.5
41-45	21.4	27.9	15.1	4.7	29.9	58.7
≥ 46	61.2	51.6	84.2	17.1	21.0	27.8
Total	100	100	100	100	100	100

LORDS COVE

Trapped		Meshed	
Mesh Size (inches)			
3 1/2 %	4 %	3 1/2 %	4 %
35.0	3.5	92.3	12.6
43.0	21.7	6.4	55.3
22.0	74.8	1.2	32.1
100	100	100	100

MUSGRAVE HARBOUR

Length (cm.)	Trapped		Meshed	
	Mesh Size (inches)			
	3 5/8 %	4 %	3 5/8 %	4 %
≤ 40	29.5	8.3	76.4	47.2
41-45	32.8	26.6	15.4	42.9
≥ 46	37.7	65.1	8.2	9.9
Total	100	100	100	100

POUCH COVE

Trapped		Meshed	
Mesh Size (inches)			
3 5/8 %	4 %	3 5/8 %	4 %
0.8	0.9	76.7	10.6
22.7	12.4	23.3	43.8
76.5	86.7	-	45.6
100	100	100	100

PROPORTION OF SAMPLED MESHED AND TRAPPED FISH GREATER THAN 40 CENTIMETERS, BY MESH SIZE

Mesh Size (inches)	SELDOM, FOGO ISLAND		LORDS COVE		MUSGRAVE HARBOUR		POUCH COVE	
	Trapped	Meshed	Trapped	Meshed	Trapped	Meshed	Trapped	Meshed
3 1/2	0.83	0.22	0.65	0.C8	-	-	-	-
3 5/8	0.79	0.51	-	-	0.71	0.24	0.99	0.23
4	0.99	0.87	0.96	0.87	C.92	0.53	0.99	0.89

PH/jf
October 5, 1983

THE NUMBER, MEAN LENGTH AND VARIANCE OF SAMPLED MESHED AND TRAPPED FISH, BY MESH SIZE

	SELDOM, FOGO ISLAND						LORDS COVE			
	Mesh Size (inches)						Mesh Size (inches)			
	3 1/2		3 5/8		4		3 1/2		4	
	Meshed Fish	Trapped Fish	Meshed Fish	Trapped Fish	Meshed Fish	Trapped Fish	Meshed Fish	Trapped Fish	Meshed Fish	Trapped Fish
$n = \Sigma f$	828	288	391	560	1,425	999	2,476	1,681	839	626
$\bar{x}$ (cm.)	37.1	47.8	41.1	46.0	44.9	51.0	36.6	42.4	43.9	47.8
s^2	91.0	42.2	32.4	39.1	30.5	26.1	11.6	22.4	37.4	16.4

	MUSGRAVE HARBOUR				POUCH COVE			
	Mesh Size (inches)				Mesh Size (inches)			
	3 5/8		4		3 5/8		4	
	Meshed Fish	Trapped Fish	Meshed Fish	Trapped Fish	Meshed Fish	Trapped Fish	Meshed Fish	Trapped Fish
$n = \Sigma f$	597	390	851	553	446	520	1,337	1,793
$\bar{x}$ (cm.)	38.3	45.0	42.4	48.5	38.7	50.3	45.3	52.0
s^2	21.1	44.5	13.1	42.9	89.5	32.6	12.6	32.3

CHI SQUARE TESTS ON DISTRIBUTION OF LENGTHS OF SAMPLED MESHED AND TRAPPED FISH, SELDOM, FOGO ISLAND

A.

Length (cm.)	MESHED Observed 3 1/2"	MESHED Observed 4"	MESHED Expected 3 1/2"	MESHED Expected 4"	TRAPPED Observed 3 1/2"	TRAPPED Observed 4"	TRAPPED Expected 3 1/2"	TRAPPED Expected 4"
≤ 40	647	193	309	531	242	7	145	104
41-45	39	836	321	553	297	151	261	187
≥ 46	142	396	198	341	852	841	985	708
Total	828	1,425	828	1,425	1,391	999	1,391	999
X^2		1,004				1210		

B.

Length (cm.)	MESHED Observed 3 5/8"	MESHED Observed 4"	MESHED Expected 3 5/8"	MESHED Expected 4"	TRAPPED Observed 3 5/8"	TRAPPED Observed 4"	TRAPPED Expected 3 5/8"	TRAPPED Expected 4"
≤ 40	192	193	83	302	115	7	44	78
41-45	117	836	205	748	156	151	110	197
≥ 46	82	396	103	375	289	841	406	724
Total	391	1,425	391	1,425	560	999	560	999
X^2		235				263		

CHI SQUARE TESTS ON DISTRIBUTION OF LENGTHS OF SAMPLED TRAPPED & MESHED FISH, MUSGRAVE HARBOUR

Length (cm.)	Meshed				Trapped			
	Observed		Expected		Observed		Expected	
	3 1/2"	4"	3 1/2"	4"	3 1/2"	4"	3 1/2"	4"
≤ 40	456	402	354	504	115	46	67	94
41-45	92	365	188	269	128	147	114	161
≥ 46	49	84	55	78	147	360	210	297
Total	597	851	597	851	390	553	390	553
x^2			135				94	

PH/jf
October 7, 1983

CHI SQUARE TESTS ON DISTRIBUTION OF LENGTHS OF SAMPLED TRAPPED AND MESHED FISH, LORDS COVE

Length (cm.)	Meshed				Trapped			
	Observed		Expected		Observed		Expected	
	3 1/2"	4"	3 1/2"	4"	3 1/2"	4"	3 1/2"	4"
≤ 40	2,286	106	1,787	605	588	22	444	166
41-45	160	464	466	158	723	136	626	233
≥ 46	30	269	223	76	370	468	611	227
Total	2,476	839	2,476	839	1,681	626	1,681	326
x^2	2,002				577			

PH/jf
October 7, 1983

CHI SQUARE TESTS ON DISTRIBUTION OF LENGTHS OF SAMPLED MESHED AND TRAPPED FISH, POUCH COVE

Length (cm.)	MESHED				TRAPPED			
	Observed		Expected		Observed		Expected	
	3 5/8"	4"	3 5/8"	4"	3 5/8"	4"	3 5/8"	4"
≤ 40	342	142	122	363	4	16	5	16
41-45	104	1,195	324	974	118	223	78	264
≥ 46					398	1,553	439	1,513
Total	446	1,337	446	1,337	520	1,793	520	1,793
x^2	735				33			

Z TESTS ON PROPORTION OF SAMPLED MESHED AND TRAPPED FISH GREATER THAN 40 CENTIMETERS, BY MESH SIZE

	SELDOM FOGO ISLAND	LORDS COVE	MUSGRAVE HARBOUR	POUCH COVE
4" mesh vs 3 5/8" mesh	16.06	-	11.13	27.17
4" trap vs 3 5/8" trap	13.99	-	8.43	-0.26
4" mesh vs 3 1/2" mesh	31.68	44.51	-	-
4" trap vs 3 1/2" trap	13.18	15.24	-	-

PH/jf
October 5, 1983

t - TESTS ON AVERAGE CATCH PER HAUL

	SELDOM, FOGO ISLAND		LORD'S COVE		MUSGRAVE HARBOUR		POUCH COVE	
	test statistic	t at 0.05 level of significance	test statistic	t at 0.05 level of significance	test statistic	t at 0.05 level of significance	test statistic	level of significance
4" trap vs. 3 5/8" trap	1.7693	2.0452			0.5107	2.120	2.0088	2.0378
	1.4981							
4" trap vs. 3½" trap	1.4981	2.0301	-1.2570	2.0042				

t-tests on Mean Lengths of Sampled Meshed and Trapped Fish

	Seldom, Fogo Island	Lord's Cove	Musgrave Harbour	Pouch Cove
4" meshed vs 3 5/8" meshed	12.08	-	19.07	21.17
4" trapped vs 3 5/8" trapped	16.83	-	11.64	6.99
4" meshed vs 3 1/2" meshed	31.51	41.08	-	-
4" trapped vs 3 1/2" trapped	8.64	25.57	-	-
t-value for 95% confidence interval		$t_{.05} = 1.645$		